



Response to Consultation Paper on

Australia's Research Workforce Strategy

A submission by

Australian Academy of Technological Sciences and Engineering

to the

Department of Innovation, Industry, Science and Resources

5 August 2010

Australia's Research Workforce Strategy

The Academy of Technological Sciences and Engineering¹ ATSE notes with approval the Australian Government's intention to develop a research workforce strategy as outlined in *Powering Ideas: An Innovation Agenda for the 21st Century* and is pleased to respond to the consultation paper *Australia's Research Workforce Strategy* prepared by the Department of Innovation, Industry, Science and Research.

Summary

- ATSE supports the Government's focus on innovation as a key driver of national success. Using higher degree research education to firmly embed a culture of innovation in the nation should be regarded as a key challenge to be faced over the next decade.
- While the consultation paper talks of maintaining the steady growth in researcher employment, ATSE suggests that there will be significantly increased demand. Meeting this will require a re-think of current research training with a much closer involvement of industry and public-sector research organisations in the process.
- ATSE strongly cautions against a "one-size-fits-all" approach and proposes that the engineering, technology and applied science disciplines be grouped and examined to see if a collaborative research experience with industry or public sector laboratories would be desirable.
- Maximising the potential of research students to be involved in world-class research and utilising in full existing public and private sector research facilities is highly desirable but will require levels of cooperation far greater than at present. Providing financial incentives to bring this about has great merit.
- ATSE believes that the greatest benefit for career paths can be obtained by schemes that encourage researchers to move freely between universities, industry and government laboratories. The challenge is to ensure that such people are not disadvantaged in promotion.
- ATSE broadly supports the opportunities that have been identified to better support researchers at different stages of their careers, but sees a much stronger role for professional and learned societies in fostering career opportunities and providing career monitoring.
- ATSE notes some progress on priority areas for action but sees the role of Government to take a lead role in getting further action started and to follow up with universities through the compact negotiation process. The involvement of peak industry bodies at an early stage in the process will be vital. ATSE expresses its willingness to play a part in the process, especially with regard to those disciplinary areas which its membership embraces.
- Similarly, urgent action is needed to ensure that the Government's plan for greater innovation in Australian enterprise is strongly supported by appropriately trained research graduates. This will not occur unless the national consciousness is raised and universities and industry cooperate significantly more than in the past.

¹ ATSE was established in 1975 with the mission to promote the application of scientific and engineering knowledge to the future benefit of Australia. ATSE is one of four learned national Academies, which have complementary roles and work together both nationally and internationally. ATSE has about 800 elected Fellows who are the leaders of applied science and engineering across the country.

Australia's Research Workforce Strategy

Many ATSE Fellows hold higher degree research qualifications. The majority is, or has been, active in promoting innovation in the private and public sectors of the Australian economy and is closely familiar with the need for a well-trained research workforce to support the national research and development effort. They see opportunity for and the benefits from a significantly increased proportion of research-trained personnel in management roles in the private sector as a driver of innovation. They are also conscious of the need to additionally train sufficient numbers to meet the demand for instructors and researchers in universities and public sector research institutions.

ATSE cautions the Government against taking an overly narrow view of the innovation cycle. Whilst basic or fundamental research carried out in universities has a role in bringing about step-changes in technologies, quality applied research is a necessary precursor of the incremental changes that maintain world leadership within the industrial sector. Research trainees in appropriate disciplines should be exposed to this. For this reason ATSE is supportive of greater collaboration between research training institutions, government research laboratories and the private sector.

ATSE is also attracted to the example set by a number of overseas countries that have deliberately fostered a technological culture by training a much larger proportion of engineers and applied scientists than in Australia and ensuring that the most talented of these progress to research higher degrees so that they can be trained in the tapping of the world's knowledge and innovation. Examples include Korea, Japan, Finland, Ireland and the Scandinavian States. In these countries significant numbers of higher degree graduates are to be found working in industry.

ATSE shares the Government's concern about the quality of training provided in university higher degree programs and offers some suggestions in this regard. It believes that the question of career paths for researchers can be resolved in part by mechanisms that provide for freer career movement between universities, industry and public sector bodies.

Responses to the questions raised in the Consultation Paper follow.

Q1: *Do the issues identified adequately capture the challenges facing Australia in adapting to the changing nature of employer demand and meeting its innovation aspirations over the next decade? If not, what other challenges should be considered?*

The consultation paper provides a useful overview of the challenges facing Australia, but the Academy's thinks it seriously underestimates the importance to Australia of having significant numbers of higher degree research trained people in industry. Such people need not necessarily work directly in research in industry but, by dint of their training, are closely attuned to the need to innovate and have the capacity to keep current with developments overseas and to so ensure that Australian industry maintains an internationally competitive position. Nowhere is this more important than in the industries

Australia's Research Workforce Strategy

supporting the resources sector and agribusiness, which both contribute substantially to the Australian economy. The present relatively low proportion of such people in industry much more likely reflects on the scarcity of research graduates than on any unwillingness in industry to hire them. In the advanced industrial economies, such as the United States, high-performing graduates automatically seek to complete research training as a precursor to high level entry to the corporate sector.

Without access to the raw data behind Figure 2 it is difficult to comment fairly on the accuracy of the predictions of shortfall provided. Noting that a significant proportion of the 60,000 existing academic staff at Australia's universities are close to retiring age and will need to be replaced in the near future, the demand for research-qualified staff will be significant. A further demand pressure that may have been overlooked is the requirement in the Australian Qualification Framework that those employed by non-university higher education institutions should hold a qualification one AQF level above the course that they teach. When these considerations are coupled with increased demand by industry and other sectors of the economy, as they increase their innovative capacity by hiring research-trained staff, the Allen estimates should probably be viewed as highly conservative. Two further factors that will influence the availability of research-trained personnel in Australia are the likely impact of European moves to target GERD growth by offering overseas employment opportunities to OECD higher degree research graduates like Australians² and a less than satisfactory pipeline of year 12 science students from the Australian secondary education system into engineering, technology and applied science undergraduate programs.

ATSE is supportive of the Government's focus on innovation as a key driver of national success. Using higher degree research education to firmly embed a culture of innovation in the nation should be regarded as a key challenge to be faced over the next decade.

Q2: *Do the issues identified adequately capture the opportunities available to Australia to better respond to the changing nature of employer demand in Australia and meet national innovation aspirations? If not, what other opportunities should be considered?*

ATSE thinks there are significant opportunities in moving Australia to an innovation-based economy. While the consultation paper talks of maintaining the steady growth in researcher employment that has been achieved over the last decade, ATSE suggests that there will be significantly increased demand. Meeting this will require a re-think of current research training with a much closer involvement of industry and public-sector research organisations in the process. There is a real opportunity for Australia to develop new approaches that foster innovation and are based on models which have the potential to be recognized as excellent around the world.

² Allen Consulting Group report *International Factors Influencing the Availability of Australia's Science, Engineering and Technology Skills*, June 2005

Australia's Research Workforce Strategy

ATSE supports the adoption of better workforce planning and development, more ready access of employers to local and international staff, and the better dissemination of information about research employment needs and opportunities. It notes that the employment of research-degree-qualified international students offers an excellent way for Australia to boost its availability of researchers as such students are invariably from the top tier of the university from which they first graduated (as are Australian research students).

Q3: Do the issues identified adequately capture the challenges facing Australia in delivering required levels of research skills to its workforce over the next decade? If not, what other challenges should be considered?

The issues canvassed in the consultation paper cover most of the relevant areas but, except in a limited number of instances, do not provide possible solutions to problems identified. Previous government actions (e.g. the completions component of the Research Training Scheme) have ensured that universities have tightened periods of candidature but this has frequently been at the expense of allowing a student to complete the degree while working in industry. Similarly, the upcoming focus of *Excellence in Research Australia (ERA)* on staff publications in top-ranked journals may disincline research students from pursuing applied research in collaboration with outside sponsors. With respect to commencing students, historic trends suggest that the best time to recruit research students is in times of economic downturn. But it is at such times that government and industry cut back on funding. Making quality information on job opportunities to graduating students is obviously desirable.

The elephant in the room remains the perceived worth of higher degree research training in the eyes of potential employers. Industry frequently regards PhD graduates, in particular, as too narrow and unappreciative of aspects of the commercial world. Whilst it is prepared to train an incoming first degree graduate in these aspects it expects a PhD entrant to quickly move to a senior position. ATSE supports the suggestion in the discussion paper that the current research training model (largely based on a master-apprentice relationship) should be reviewed by potential employers and universities working collaboratively. It strongly cautions against a “one-size-fits-all” approach and proposes that the engineering, technology and applied science disciplines could be grouped and examined to see if a collaborative research experience with industry or a public sector laboratory would be desirable.

Australia's Research Workforce Strategy

Q4: Do the issues identified adequately capture the opportunities available to Australia to enhance its supply of research skills over the next decade? If not, what other opportunities should be considered?

ATSE believes that Australia is in a unique position for the Government to encourage a review of research training, getting all stakeholders involved in the exercise. Maximising the potential of research students to be involved in world-class research and utilising in full existing public and private sector research facilities are highly desirable but will require levels of cooperation far greater than at present. Providing financial incentives to bring this about has great merit.

At a time when some universities have introduced a 3 + 2 year program in some professional disciplines, the national cost benefit of this against a greater encouragement of the highest performing students to undertake a research degree needs to be evaluated.

Q5: Do the issues identified adequately capture the challenges facing Australia in providing productive and viable career paths to its researchers over the next decade and promoting them adequately? If not, what other challenges should be considered?

ATSE considers that the consultation document adequately covers the challenges facing Australia in providing productive and viable career paths to its researchers. Whilst it acknowledges that the provision of vertically integrated positions makes good sense, it believes that the greatest benefit can be obtained by schemes that encourage researchers to move freely between universities, industry and government laboratories. The challenge is to ensure that such people are not disadvantaged in promotion. Similarly, some universities provide gap funding where a full-time researcher's salary is carried for a period between research grants. The provision or otherwise of such support measures is an issue that could profitably be discussed with individual institutions during their annual compact negotiations. Those who follow applied research careers should not be disadvantaged.

It is noteworthy that some higher-degree research graduates are unaware of significant opportunities in the Science Industry. Making such information widely available remains a significant challenge.

Australia's Research Workforce Strategy

Q6: Do the issues identified adequately capture the opportunities available to Australia to better support researchers at different stages of their careers over the next decade? If not, what other opportunities should be considered?

ATSE broadly supports the opportunities that have been identified but sees a much stronger role for the professional societies and Learned Academies in fostering career opportunities and providing career monitoring. This is a role that was done quite effectively in the past but has lessened in impact as university staff, in particular, have become less enthusiastic about spending time in attending technical meetings and of encouraging their research students to do likewise so that they can establish a network of potential professional contacts. Quite how best to reinvigorate this practice is moot but it is believed that the professional societies would be responsive to encouragement from government.

Q7: Are the priority areas for action outlined in Table 1 the right ones? What other priorities should be identified?

ATSE supports the priority areas listed in Table 1. With regard to the **Actions** listed it would suggest the additions in the table below.

Actions by Government	<p>Under 2(d) (Short Term) add:</p> <ul style="list-style-type: none">• Significantly increase the number of ARC Linkage grants with a research training component and enhance the number of APA(I)s• Explore with universities in compact negotiations the opportunities to make more use of co-supervisors from the private sector in PhD programs and the way such arrangements are handled in institutional assessment procedures <p>Under 5 (Short Term) add:</p> <ul style="list-style-type: none">• Under compact negotiations explore with universities the effectiveness of their higher degree research programs in preparing graduates as effective vectors for innovation in their subsequent careers <p>Under 6 (Short Term) add:</p> <ul style="list-style-type: none">• Explore with ARC the possibility of grants to research students to pay the access costs to national facilities established under the NCRIS scheme
Actions by Universities and other research training providers	<p>Under 2 (b) (Short Term) add:</p> <ul style="list-style-type: none">• and national re-evaluation of the structure of PhD programs to determine whether

Australia's Research Workforce Strategy

	modification of the current supervisory model (minimum coursework) remains effective
Actions by Researcher Employers	Under 2 (Short Term) add: <ul style="list-style-type: none">possibly by adding practicum periods in industry R&D to foster industry readiness in appropriate disciplines

Q8: Does the allocation of responsibilities for priority areas and actions outlined in Table 1 adequately capture the roles of all parties? Are there any issues relating to the allocation of responsibilities that need to be considered?

Whilst ATSE is content with the assignment of responsibilities shown on Table 1, it notes that little progress on many of the issues highlighted has been made over the past two decades and sees the role of Government to take the lead in getting action started and to follow up with universities through the compact negotiation process. The involvement of peak industry bodies at an early stage in the process will be vital. ATSE expresses its willingness to play a part in the process, especially with regard to those disciplinary areas which its membership embraces.

Q9: Are the timeframes outlined in Table 1 appropriate? Are there any priority areas that require more immediate or longer-term action?

ATSE is somewhat disappointed at the relatively prolonged time frame over which activity is planned. Getting sufficient numbers of well-trained research higher degree graduates by 2020 will not occur unless a concerted effort is made to improve things in a relatively short (2-5 year) time frame. Similarly, urgent action is needed to ensure that the Government's plan for greater innovation in Australian enterprise is strongly supported by appropriately trained research graduates. This will not occur unless the national consciousness is raised and universities and industry cooperate significantly more than in the past.

5 August 2010